

## THE GENUS *BRASSAVOLA* AS AN EXAMPLE OF INFRAGENERIC EVOLUTION IN THE *ORCHIDACEAE*

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**SUMMARY :** A synopsis of the four taxonomic sections of the orchid genus, *Brassavola*; and a brief discussion of its infrageneric evolution, with special reference to the geographical distribution of the component species.

The genus *Brassavola* was established by the English botanist, Robert BROWN, in the fifth volume of AITON's *Hortus Kewensis* (1813), on the basis of a species which had been designated *Epidendrum cucullatum* by LINNAEUS in the second edition of *Species Plantarum* (1763). BROWN gave no indication as to the origin of the generic name, but it is believed to have honoured the early Italian scientist, Dr. Antonio Musa BRASSAVOLA (1500-1555), a pupil of LEONICENUS, who subsequently became Professor of Logic, Physics and Medicine at the University of Ferrara. He is also said to have performed tracheotomy and is, moreover, credited with the remarkable achievement of having diagnosed more than two hundred different kinds of syphilis.

The geographical area covered by the distribution of the genus falls naturally into three main regions: (1) Mexico and Central America—the phytogeographical region known to biologists as Middle America; (2) the islands of the West Indies; and (3) South America. As I have indicated elsewhere (JONES 1967), the main centre of distribution for the genus undoubtedly lies in the first of these three regions, with two branches or channels of dispersal: one extending down through the West Indies to Trinidad; and the other through northern South America—where there appears to be a secondary centre of distribution in Colombia—to Argentina. On the basis of these three regional divisions, the species and varieties of *Brassavola* may be split up into five smaller groups, as follows:

- A: Taxa common to all three regions.
- B: Taxa peculiar to Middle America.
- C: Taxa shared by Middle America and the West Indies.
- D: Taxa peculiar to the West Indies.
- E: Taxa peculiar to South America.

The genus *Brassavola*, as I understand it, consists of twenty species and five varieties. Table 1, below, contains a statistical analysis of these twenty-five taxa, based upon the five groups described above; while in Table 2, I have attempted to chart their infrageneric evolution, based upon the characters of gross morphology and floral anatomy, which DRESSLER (1960) and SWAMY (1949) have shown to be the most reliable in evaluating the relative evolutionary position of orchid taxa. It was most interesting to note that when the species and varieties were arranged in this pattern, it was also possible to distinguish quite clearly the five geographical groups mentioned above.

TABLE 1.  
Statistical analysis of *Brassavola*; for definition of groups, see text.

CLASSIFICATION	GENUS		§1	§2	§3	§4
Group A .....	8 %	2	0	1	0	1
Group B .....	32 %	8	3	1	0	4
Group C .....	4 %	1	0	0	0	1
Group D .....	12 %	3	0	0	0	3
Group E .....	44 %	11	0	0	11	0
Total .....	100 %	25	3	2	11	9

Taxonomists have divided the genus into four sections (ROLFE 1902, SCHLECHTER 1919, JONES 1969), which may be keyed as follows:

- Leaves broad and flat; flowers relatively large ..... Sect. 1. *Grandiflorae*
- Leaves narrow, terete or semiterete; flowers smaller :
  - Apex of the labellum attenuated to a long, slender point.... Sect. 2. *Brassavola*
  - Apex of the labellum not attenuated:
    - Labellum sessile, broadening abruptly outwards from the base..... Sect. 3. *Sessililabia*
    - Labellum cuneiform, base constricted to a narrow, claw-like tube... Sect. 4. *Cunellabia*

In regard to the above sections, the following may be said:

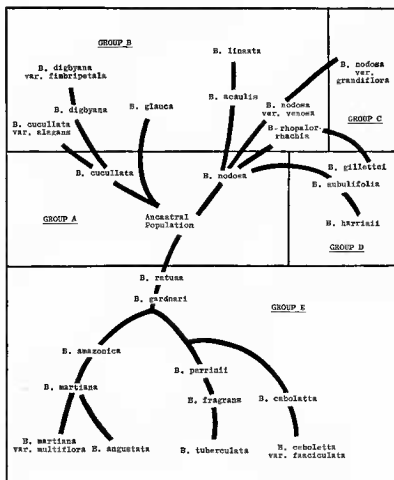
#### Sect. 1. *GRANDIFLORAE*

This large-flowered section, which is confined geographically to the Middle American region, consists of only three taxa: *B. glauca*, *B. digbyana* and *B. digbyana* var. *fimbripetala*; but these have always been a source of much controversy among taxonomists, who have moved them back and forth between the genera *Brassavola*, *Laelia* and *Rhyncholaelia* with bewildering frequency. However, the results of recent research by DRESSLER (1959) have proved conclusively that they fit into *Brassavola* better than they do elsewhere. This view was subsequently given unintentional support

by a member of the "opposition": OSTERREICH (1967) —apparently not realizing that *B. cucullata* is the generic type of *Brassavola*— suggested that this species should also be transferred to *Rhyncholaelia*!

In the species of Sect. *Grandiflorae*, the flowers are usually borne singly on a terminal peduncle; but *B. digbyana* occasionally produces an abnormal type of fasciculate inflorescence —a condition which has also been recorded for at least one species in each of the other three sections (JONES 1967, PABST 1955). This type of abnormal inflorescence in the *Orchidaceae* may be compared with what is known as the "witches' broom" phenomena— a pathomorphological condition affecting the foliage and inflorescence of certain other plant families (BOS 1957).

TABLE 2.  
Infrageneric evolution of *Brassavola*.



Sect. 2. *BRASSAVOLA*

This is the smallest section of the genus, consisting of only one species and one variety: *B. cucullata* and *B. cucullata* var. *elegans*. It is a singularly happy coincidence that *B. cucullata* happens to be the taxonomic type of *Brassavola*; for it also appears to be the most primitive species of the genus, and may, therefore, be regarded as the evolutionary type as well. The narrow seimterete foliage of *B. cucullata* is certainly the dominant foliage-type of the genus —being found in three of the four sections, with Sect. *Grandiflorae* as the exception. The unusual form of the floral peduncle, however, and the long sterile beak to the ovary together provide a strong connecting link between the sections *Brassavola* and *Grandiflorae*.

It has also been observed that the nocturnal fragrance which is found in some of the more advanced species of sections *Grandiflorae* and *Cuneilabia* is less pronounced in *B. cucullata*. In the former taxa, the reproductive organs are usually concealed within a narrow tube formed by the overlapping margins of the side-lobes of the labellum; therefore the nocturnal fragrance appears to be a later feature, evolved for the purpose of guiding insect-pollinators (DODSON 1969, DRESSLER 1968, HILLS 1968). In *B. cucullata*, however, the labellum is completely explanate, and the reproductive organs readily accessible to pollinators.

Sect. 3. *SESSILILABIA*

There are nine species and two varieties in this section, which is the largest of the genus, and is confined geographically to the South American continent. Two evolutionary groups are discernible among the taxa, which were treated by SCHLECHTER (1919) as two distinct sections. In the first group, consisting of *B. amazonica*, *B. angustata*, *B. martiana* and *B. martiana* var. *multiflora*, the labellum is relatively narrow, with fimbriate margins; and the taxa are largely of northern distribution —extending from the Guianas through Venezuela and Colombia to northern Brazil. The second group consists of *B. tuberculata*, *B. fragrans*, *B. perrinii*, *B. ceboletta*, *B. ceboletta* var. *fasciculata* and *B. retusa*; here the labellum is broader, with unbroken margins, and the taxa are found mainly in Brazil, Peru, Bolivia, Paraguay and northern Argentina. The difference between the two groups, however, is somewhat blurred by the existence of *B. gardneri*, which undoubtedly represents an intermediate stage of evolutionary development (JONES 1970, 1971).

Sect. 4. *CUNEILABIA*

This is the second largest section, with seven species and two varieties (JONES 1972, 1972a). From the point of view of floral morphology alone, these taxa probably represent the most homogeneous section of the genus; but nevertheless, as in the preceding section, two evolutionary trends are again discernible —only here, the two groups are much more clearly defined. The first consists of *B. nodosa* with its varieties *venosa* and *grandiflora*, *B. rhopalorrhachis*, *B. subulifolia*, *B. harrisii* and *B. gillettei* — in which the

flowers are borne on relatively tall, terminal racemes; and the taxa are widely distributed from Mexico, through the West Indian islands to northern South America (JONES 1968, 1969a).

The second group consists of only two species, *B. acaulis* and *B. lineata*, which are confined to a relatively small area of Central America; and in which the form of the inflorescence is completely different from that of any other group in the genus — the flowers being borne on short, lateral shoots, singly in *B. acaulis*, but 2-3-flowered in *B. lineata*. On the basis of this characteristic alone, which marks the group as one of the most advanced in the genus, it may eventually prove worthwhile to place *B. acaulis* and *B. lineata* in a separate section. One hesitates to propose new taxa in a family such as the *Orchidaceae*, where so many already exist; but nevertheless, where these result in a more meaningful picture of orchid-relationships as a whole, or contribute towards our better understanding of their evolution, the step should certainly be taken.

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